

Remarks**Application Status and Disposition of Claims**

This paper responds to the Final Office Action mailed April 6, 2010. In the Final Action, the Office considered claims 3, 6, 7, 9, 10, 13-15, and 18.

With this paper, claims 13-15 are amended and claims 3 and 7 are canceled. The amendments to claim 13 find support throughout the specification and also in previous claims 3 and 7. Applicants add new claims 19 and 20, which find support in the specification and the prior claims.

Claims 6, 9, 10, 13-15, and 18-20 are pending and under consideration.

Claim Rejections – 35 U.S.C. § 103

The Action rejects claims 3, 6, 7, 9, 10, 13-15, and 18 under 35 U.S.C. § 103 as allegedly unpatentable over Atsumi et al. (JP 10-118167) in view of Ichitsuka et al. (U.S. Patent No. 5,651,884). The Action also rejects the same claims over Ichitsuka et al. in view of Atsumi. Applicants respectfully disagree with the rejections for the reasons that follow.

Applicants note that amended claim 13 recites that the method for manufacturing the adsorption apparatus comprises the step of preparing the column in which the adsorbent filling space is filled with the claimed apatite particles and the step of passing the solution containing the Fe³⁺ through the adsorbent filling space of the column at the claimed flow rate so that the Fe³⁺ is selectively bonded to the phosphate group contained in the apatite forming the surface of each of the apatite particles and thereby obtaining the adsorbent. Claim 13 also now recites the combination of features previously recited separately in claims 3 and 7.

By using the process of claim 13 of passing the solution containing the Fe³⁺ through the adsorbent filling space of the column filled with the claimed apatite particles, the Fe³⁺ can be

selectively bonded to the surface of each of the apatite particles, to thereby obtain the adsorbent. Such an adsorbent is difficult to produce using an immersion process, as explained below. Applicants particularly note that because the solution is passed through the adsorbent filling space at the claimed rate, the Fe³⁺ can be sufficiently bonded to the surface of each of the apatite particles. Further, in the case in which the average particle size of the adsorbent is in the claimed range, each of the apatite particles in the column can have a sufficiently large surface area. This makes it possible to effectively bond the Fe³⁺ to the surface of each of the apatite particles in the step of passing the solution through the adsorbent filling space. The resulting adsorption apparatus containing the adsorbent in the column, after passing the solution containing the Fe³⁺ through it, can selectively adsorb a phosphorylated protein from various proteins. Applicants submit that this is not taught or suggested by the cited art.

Atsumi et al. discloses that a slurry of an apatite is added to a solution containing Fe (NO₃)₃ 9H₂O as a metallic salt. In other words, *the apatite is immersed into the solution*, to thereby obtain an adsorbent comprising the apatite with Fe³⁺ (see paragraphs 0055 and 0056 of Atsumi et al.). Applicants respectfully submit that in the immersion process of Atsumi et al., which is different from the process of the present invention, the Fe³⁺ is not *selectively bonded to the surface of the apatite* like the present invention, but is *exchanged for Ca²⁺ contained in the apatite*.

The support for this conclusion is provided as follows. Atsumi et al. discloses that Ca²⁺ contained in the apatite is easily ionic-exchanged, and that the ratio between Ca²⁺ and PO₄³⁻ each contained in the apatite is changed depending on the kinds and/or amounts of metal elements to be carried on the apatite (see paragraphs 0030 and 0031 of Atsumi et al.). This conclusion is also supported by Wakamura et al. (Colloids and Surfaces A), which discloses that “[t]he exchange mechanism with metal ions depends on the substituting methods and kinds of metal ions. It is therefore concluded that the surface structure and composition of CaHap can be controlled by the substitution with metal ions” (see page 304, 4. Conclusions). Furthermore, in the immersion process of Atsumi et al., the apatite is immersed into the solution containing Fe (NO₃)₃ 9H₂O for

24 hours (see paragraph 0056 of Atsumi et al.) while in the present invention, the solution containing the Fe³⁺ is fed into the column filled with the claimed apatite particles at the claimed flow rate *only for 10 minutes* to thereby obtain the adsorbent (see page 19, 6th paragraph of the English specification of this application).

Applicants also respectfully note that Atsumi et al. does not disclose or suggest the process of the present invention of passing the solution containing the Fe³⁺ through the adsorbent filling space of the column filled with the apatite. Atsumi et al. also does not also disclose or suggest an average particles size of the adsorbent finally obtained. Accordingly, Atsumi et al. fails to disclose or suggest these features of the present invention. Applicants submit that Ichitsuka et al. fails to remedy the deficiencies of Atsumi et al.

Ichitsuka et al. discloses a column packing material (adsorbent) useful in liquid chromatography. Ichitsuka et al. also discloses that the column packing material is made of an apatite such as Ca₁₀(PO₄)₆(OH)₂, Ca₃(PO₄)₂, Ca₁₀P₂O₇, Ca(PO₃)₂, Ca₁₀(PO₄)₆F₂, or Ca₁₀(PO₄)₆Cl₂ (see column 7, lines 33 to 36 of Ichitsuka et al.) and has an average particle size of about 2 to 100 µm (see column 9, lines 26 to 27 of Ichitsuka et al.). However, the column packing material of Ichitsuka et al. does not have Fe³⁺ as a component thereof. Therefore, Ichitsuka et al. does not disclose or suggest the process of the present invention of passing the solution containing the Fe³⁺ through the adsorbent filling space of the column filled with the apatite. Therefore, Ichitsuka et al. does not disclose or suggest these feature of the present invention.

In view of the foregoing remarks and amendments, Applicants submit that Atsumi et al. and Ichitsuka et al. fail to establish a *prima facie* case of obviousness.

Applicants have added new claims 19 and 20. New claim 19 is directed to an adsorbent comprising apatite particles similar to that recited in amended claim 13 wherein Fe³⁺ is bonded to a phosphate group contained in the apatite forming the surface of each of the apatite particles. Applicants submit that in the adsorbent of Atsumi et al., the Fe³⁺ is not selectively bonded to the surface of the apatite, but rather, is exchanged for Ca²⁺ contained in the apatite. Further, neither

Atsumi et al. nor Ichitsuka et al. disclose or suggest that the Fe³⁺ is bonded to a phosphate group contained in the apatite forming the surface of each of the apatite particles as the present invention.

In view of the foregoing remarks, Applicants respectfully submit that the combination of Atsumi et al. and Ichitsuka et al. (in any proper manner) fails to establish a *prima facie* case of obviousness of the present claims. Applicants respectfully request withdrawal of the rejection.

Conclusion

In view of the foregoing remarks, the Examiner is respectfully requested to reconsider and withdraw the rejections of record, and allow each of the pending claims.

If any issues yet remain which can be resolved by telephone, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,
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